

REMARKS

Because the 6/2/04 office action denied entry of the amendment filed 3/29/04, the present amendment indicates the changes to the claims relative to the originally filed claims, not relative to the claims of the non-entered 3/29/04 amendment.

Drawings

Formal drawings are submitted with this amendment. Figure 1 is labeled "Prior Art" as required by the examiner.

§112 Rejections

Claims 1–19 were rejected as indefinite because "it is not clear what is referenced as a byproduct of the process and how it is different from the products of the cleaning process." Applicant traverses the rejection. Regarding the alleged lack of clarity, the specification defines the byproducts as the material produced by the reaction of the plasma with the residue on the chamber wall (paragraph 5, last sentence). A specific example of such a byproduct is SiF_4 (paragraphs 16 and 23; claims 10 and 19). Regarding the alleged failure to distinguish a byproduct from a product, there is no difference in the case of a cleaning process. In the field of chemistry, a byproduct is a reaction product that is not useful in itself. In any event, Applicant has no obligation to compare byproducts to products because the term "product" is not used anywhere in the specification or claims, and the term "byproduct" is commonly used and understood in the field of chemistry.

Claims 1–10 were rejected as indefinite because "it is not clear what is referenced as 'a measure of absorbance of the radiation' and how the 'measure' be detected." To overcome the rejection, claim 1 is amended to: (i) change "detecting" to "determining"; (ii) define first and second filtering steps, as supported in the specification at paragraph 18, page 6, lines 2–8; and (iii) define how the measure is determined, i.e., by the step of subtracting the second filtered radiation from first filtered radiation, as stated in the specification at paragraph 19, page 6, lines 14–16. Regarding the support in the specification for the second filtering step, the description in the specification of a second filter 425 transmitting a band, such as 909 nm, that is "close to" the band transmitted by the first filter 420, such as 972 nm, provides support for the second band being different from the first band because "close to"

implies “different”.

Claims 1–19 were rejected as indefinite “because how can the ‘radiation absorbed by a byproduct’ be directed to an exhaust line.” To overcome the rejection, claims 1 and 11 are amended to change “radiation absorbed by” to “radiation having wavelengths overlapping an absorption band of”. The inserted language appears in the specification at paragraph 18, page 5, lines 24–25. (The SiF₄ referred to in this portion of the specification is a byproduct of the cleaning process as stated in paragraphs 16 and 23.)

Claims 1–10 were rejected as indefinite “because it is not clear what is referenced as ‘a predetermined window’.” To overcome the rejection, claim 1 is amended to: (i) add the step of amplifying the measure of absorbance to provide a voltage signal; and (ii) change “predetermined window” to “the voltage signal reaches a predetermined voltage level”, as supported in the specification at paragraph 21, page 7, lines 13–14. The “voltage signal” in claim 1 is supported by the “20x signal” which “provides an appropriate voltage” (specification paragraph 20, page 7, lines 1–2). The “20x signal” is produced by amplifying the aforesaid subtracted signal according to the specification at paragraph 19, page 6, lines 15–22.

Claims 7–10 were rejected as indefinite. Claims 7 and 8 are canceled. The rejection of claims 9 and 10 is overcome because they are amended to be dependent on claim 1 rather than claim 7.

Claims 11–19 were rejected as indefinite “because it is not clear what is referenced as ‘a measure of background radiation’.” To overcome the rejection, claim 11 is amended to change “background radiation” to the radiation filtered by a second filter defined as in claim 1. The radiation filtered by second filter 425 is the definition of background radiation in the specification at paragraph 19, page 6, lines 14–15.

Claims 11–19 were rejected as indefinite “because it is not clear how can the analyzer determine a measure of absorbance from the further radiation and background radiation” and “because it is not clear what is meant under ‘the measure to determine a measure of absorbance’.” This is similar to the rejection of claims 1–10 discussed in the second paragraph under the heading “§112 Rejections”, and the rejection is overcome by amending claim 11 similarly to the amendments of claim 1 discussed in that paragraph. Specifically, first and second filters are added to claim 11, and the detector is defined as subtracting the output of the second filter from the output of the first filter, as in claim 1. The

analyzer is deleted from claim 11 because its function is included in the detector, and the term “analyzer” does not appear in the specification outside the claims.

Claims 11–19 were rejected as indefinite and incomplete because they omit structural cooperative relationships between the detector, the analyzer and the controller. The rejection is overcome by deleting the analyzer as described in the preceding paragraph and by adding a recitation that the controller is connected to receive the signal outputted by the detector.

Claims 17–19 are rejected because they allegedly contradict claim 11. Claim 17 is canceled, and the rejection of claims 18 and 19 is overcome because they are amended to be dependent on claim 11 rather than claim 17.

§102 Rejection

Claims 11–19 were rejected under 35 USC 102(b) as anticipated by Hao (5,966,586). Hao lacks any disclosure of “a first filter positioned to receive radiation from the exhaust line, wherein the first filter transmits radiation at said absorption band of said byproduct.” Instead of such a filter, Hao’s Figure 2 embodiment has a mass analyzer 202, and Hao’s Figure 3 embodiment has a light detector 308 without any filter. Hao also lacks a “filter that transmits radiation in a band of wavelengths different from said absorption band of said byproduct.” Therefore, claims 11–19 are not anticipated by Hao.

§103 Rejection

Claims 1–19 were rejected under 35 USC 103 as unpatentable over Hao in view of WO 99/16108.

Hao lacks any disclosure of any of the following elements of the claimed invention: (i) a first filter that receives light at an absorption band of a byproduct of the cleaning process; (ii) a second filter that transmits radiation in a band of wavelengths different from said absorption band; or (iii) a detector or amplifier whose output represents the radiation transmitted through the first filter minus the radiation transmitted through the second filter.

Hao’s Figure 2 embodiment employs a mass analyzer 202, which is one or more orders of magnitude more expensive than the filters of the claimed invention, and therefore is impractical for a

production system.

Hao's Figure 3 embodiment employs a detector 308 without interposing any filter on the received radiation.

The claimed invention's subtracting the output of two filters has the advantage of inherently calibrating or normalizing the detected signal to compensate for possible changes in the optical opacity or other properties of the exhaust gases. Since this feature is not disclosed or suggested by either embodiment of Hao, claims 1-19 are patentable over Hao.

The Examiner relies on WO 99/16108 as disclosing a method of optical endpoint detection and further disclosing the use of the same endpoint detection for both etching and chamber cleaning. The Examiner's characterization of WO 99/16108 is erroneous, because the reference lacks any disclosure whatsoever related to endpoint detection. Instead, the sole purpose of the spectrometer and other components described in the reference is to detect *faults* that may occur during an etch process, such as "air leaks and varying the chuck back pressure, plasma power, bias power, wafer moisture, and load lock position." (Page 5, lines 23 and 31-33; page 2, lines 6-8; page 3, line 13; and the "Fault Detection" description beginning at page 8, line 30.)

In addition to lacking any disclosure of endpoint detection, WO 99/16108 fails to disclose any of the features of the claimed invention that Hao fails to disclose as discussed above, namely: (i) a first filter that receives light at an absorption band of a byproduct of the cleaning process; (ii) a second filter that transmits radiation in a band of wavelengths different from said absorption band; or (iii) a detector or amplifier whose output represents the radiation transmitted through the first filter minus the radiation transmitted through the second filter.

Since Hao and WO 99/16108 both lack any disclosure or suggestion of the features of the invention stated in the preceding paragraph, claims 1-19 are patentable over Hao in view of WO 99/16108.

Respectfully submitted,



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